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b) mixing said sample with a PNA probe labeled with a detectable moiety, said PNA probe having a sequence complementary to at least a portion of said selected target sequence in the presence of at least one nucleic acid/nucleic acid denaturing reagent permitting the formation of a PNA/nucleic acid complex when said selected target sequence is present;

c) separating said PNA/nucleic acid complex from other components of the mixture resulting from step b); and

d) detecting said PNA/nucleic acid complex.

33 ~~40~~. The method of claim ~~39~~ 32 wherein said nucleic acid is a DNA.

34 ~~41~~. The method of claim ~~39~~ 32 wherein said denaturing reagent is selected from the group consisting of urea, formamide, and organic solvents.

35 ~~42~~. The method of claim ~~39~~ 32 wherein said denaturing reagent comprises a low ionic strength buffer that permits adjustment of the mixture resulting from step b) to low salt concentrations.

a cont

36 ~~43~~. The method of claim ~~39~~ 32 further comprises adjusting the temperature of the medium.

37 ~~44~~. The method of claim ~~39~~ 32 wherein the detectable moiety is selected from the group consisting of enzymes, colored particles, fluorophores, biotin, chromophores, radioisotopes, electrochemicals and chemiluminescent moieties.

38 ~~45~~. The method of claim ~~39~~ 32 wherein the PNA probe is associated with a particle.

39 ~~46~~. The method of claim ~~39~~ 32 wherein the PNA probe comprises a charge-modifying moiety.

40 ~~47~~. The method of claim ~~39~~ 32 wherein step c) is conducted in a sieving medium.

41 ~~48~~. The method of claim ~~47~~ 40 wherein the sieving medium is selected from the group consisting of polyacrylamide, agarose, polyethylene oxide, polyvinyl pyrolidine and methylcellulose.

42 ~~49~~. The method of claim ~~39~~ 32 wherein step c) is conducted by electrophoresis.

43 ~~50~~. The method of claim ~~49~~ 42 wherein step c) is conducted by capillary electrophoresis.

R126 44 ~~51~~. The method of claim ~~39~~ 32 wherein step b) comprises:

a) mixing said sample with a plurality of PNA probes, each having a sequence complementary to at least a portion of a respective selected target sequence of one of said at least one strand of nucleic acid and its complementary strand under conditions permitting the formation of at least one PNA/nucleic acid complex when said respective selected target sequence is present.

45 ~~52~~. A method for detecting a plurality of selected target sequences in polynucleotides, said method comprising the steps of:

a) providing a sample comprising at least one single stranded nucleic acid sequence and its complementary strand, wherein said at least one single stranded nucleic acid sequence and its complementary strand is suspected to include a plurality of selected target sequences;

a cont

b) mixing said sample with a plurality of PNA probes each having a sequence complementary to at least a portion of a respective one of said selected target sequences of said at least one single stranded nucleic acid sequence and its complementary strand under conditions permitting the formation of at least one PNA/nucleic acid complex when said respective one of said selected target sequences is present;

c) separating said at least one PNA/nucleic acid complex from other components of the mixture from step b); and

d) detecting said at least one PNA/nucleic acid complex.

46 ~~53~~. An apparatus for detecting at least one selected target sequence in at least one polynucleotide, said apparatus comprising:

a) a sample introduction zone;

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b) at least one PNA probe, disposed to mix with a sample comprising at least one double stranded polynucleotide introduced in said introduction zone, said at least one PNA probe having a sequence complementary to a selected nucleotide target sequence suspected to be present in said at least one double stranded polynucleotide;

c) a nucleic acid/nucleic acid denaturing reagent permitting the formation of a PNA/nucleic acid complex when said selected target sequence is present; and

d) a separation zone in communication with said introduction zone, said separation zone separating said PNA/nucleic acid complexes from other components present in said introduction zone and said separation zone.

47 ~~54~~. The apparatus of claim ~~53~~ 46 wherein the separation zone comprises a sieving medium.

48 ~~55~~. The apparatus of claim ~~54~~ 47 wherein the sieving medium is selected from the group consisting of polyacrylamide, agarose, polyethylene oxide, polyvinyl pyrolidine and methylcellulose.

49 ~~56~~. The apparatus of claim ~~53~~ 46 wherein said denaturing reagent is selected from the group consisting of urea, formamide, and organic solvents.

a' cont

50 ~~57~~. The apparatus of claim ~~56~~ 49 wherein said denaturing reagent comprises a low ionic strength buffer that permits adjustment of the mixture resulting from step c) to low salt concentrations.

51 ~~58~~. The apparatus of claim ~~53~~ 46 wherein said separation zone is a capillary channel.

52 ~~59~~. The apparatus of claim ~~53~~ 46 wherein at least one of said at least one PNA probe is labeled with a detectable moiety.

53 ~~60~~. The apparatus of claim ~~59~~ 52 wherein the detectable moiety is selected from the group consisting of enzymes, colored particles, fluorophores, biotin, chromophores, radioisotopes, electrochemicals and chemiluminescent moieties.

54 ~~61~~. The apparatus of claim ~~53~~ 46 wherein at least one of said at least one PNA probe is associated with a particle.

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55 ~~62~~. The apparatus of claim ~~53~~ 46 wherein at least one of said at least one PNA probe comprises a charge-modifying moiety.

56 63. The apparatus of claim 53 further comprising a detection zone in communication with said separation zone.

57 64. The apparatus of claim 53 further comprising a sample incubation zone disposed in communication with the sample introduction zone and in communication with the separation zone.

55 63. A microchip apparatus comprising a plurality of capillary channels, each said capillary channel further comprising:

a) a sample introduction zone;

b) at least PNA probe, disposed to mix with a sample introduced in each said introduction zone, said sample comprising at least one double stranded polynucleotide and said at least one PNA probe having a sequence complementary to a selected target sequence suspected to be present in said at least one double stranded polynucleotide;

c) a nucleic acid/nucleic acid denaturing reagent permitting the formation of a PNA/nucleic acid complex when said selected target sequence is present;

d) a detection zone; and

e) a separation zone in communication with to said introduction zone and said detection zone.

59 66. The microchip apparatus of claim 58 65 wherein the separation zone of at least one of said capillary channel comprises a sieving medium.

60 67. The microchip apparatus of claim 59 66 wherein the sieving medium is selected from the group consisting of polyacrylamide, agarose, polyethylene oxide, polyvinyl pyrolidine and methylcellulose.

61 68. The microchip apparatus of claim 58 65 wherein said denaturing reagent is selected from the group consisting of urea, formamide, and organic solvents.

R126 63 69. The microchip apparatus of claim ~~65~~ 58 wherein said denaturing reagent comprises a low ionic strength buffer that permits adjustment of the mixture resulting from step c) to low salt concentrations. (sub #1)

63 70. The microchip apparatus of claim ~~65~~ 58 wherein at least one of said at least one PNA probe is labeled with a detectable moiety.

1b 64 71. The microchip apparatus of claim ~~65~~ 58 wherein at least one of said at least one PNA probe comprises a charge-modifying moiety.

65 72. The microchip apparatus of claim ~~65~~ 58 wherein the detectable moiety is selected from the group consisting of enzymes, colored particles, fluorophores, biotin, chromophores, radioisotopes, electrochemicals and chemiluminescent moieties. (sub #2)

a' cont sub 66 73. The microchip apparatus of claim ~~65~~ 58 wherein said at least one PNA probe is associated with a particle.

67 74. The microchip apparatus of claim ~~65~~ 58 wherein each said capillary channel further comprising a sample incubation zone disposed in communication with said sample injection zone and said separation zone. (sub #3)

REMARKS

Claims 1-38 were originally filed. Claims 1-38 are canceled herein and new claims 39-74 are added. New claims 39-74 are presented for examination. No new matter has been added.

This paper is submitted to conform with the requirements of 37 CFR §1.821 *et seq.*. Attached herewith is a paper copy of the sequence listing, pages 35/1 to 35/4. No new matter has been added.

Respectfully submitted,

Date: 5/2/97
Reg. No. 35,722

Thomas A. Turano, Esq.
Attorney for Applicants
Testa, Hurwitz, & Thibeault, LLP
High Street Tower
125 High Street
Boston, Massachusetts 02110

Tel. No. (617) 248-7738
Fax: (617) 248-7100